

# QUEST

ADVENTURES IN THE WORLD OF SCIENCE

## COMPUTERS

## 24

FACT FILES ON:

- ▶ *Supercomputers*
- ▶ *Biochips*
- ▶ *Robots and androids*
- ▶ *Towards the optical computer*
- ▶ *Automatic navigation systems*
- ▶ *Communication networks*

35 40

GIANT POSTER

THE CHIP THAT CHANGED  
THE WORLD

Q&A CARDS

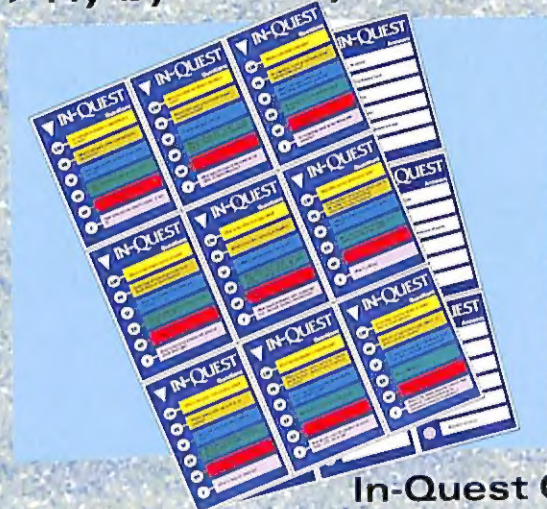
THREE PROJECTS



# INSIDE THIS PACK

## FACT FILES

- ▶ Hi-tech graphics
- ▶ Electronic brains
- ▶ Superconductors
- ▶ Electronic vandalism
- ▶ Bugs and viruses
- ▶ Fly-by-wire systems



In-Quest Q&A cards



## POSTER

The silicon chip

## SCIENTIFIC PROJECTS



## COMING IN QUEST 25 SECURITY

### FACT FILES INCLUDE:

- ▶ Surveillance techniques
- ▶ V.I.P. cars
- ▶ Radio jamming
- ▶ Animal warfare
- ▶ Martial Arts
- ▶ The sky-spies
- ▶ Defending territory



## POSTER

Body armour



## MODEL

Armadillo



ISSN 1350-3766







# PROJECTS

## COMPUTERS

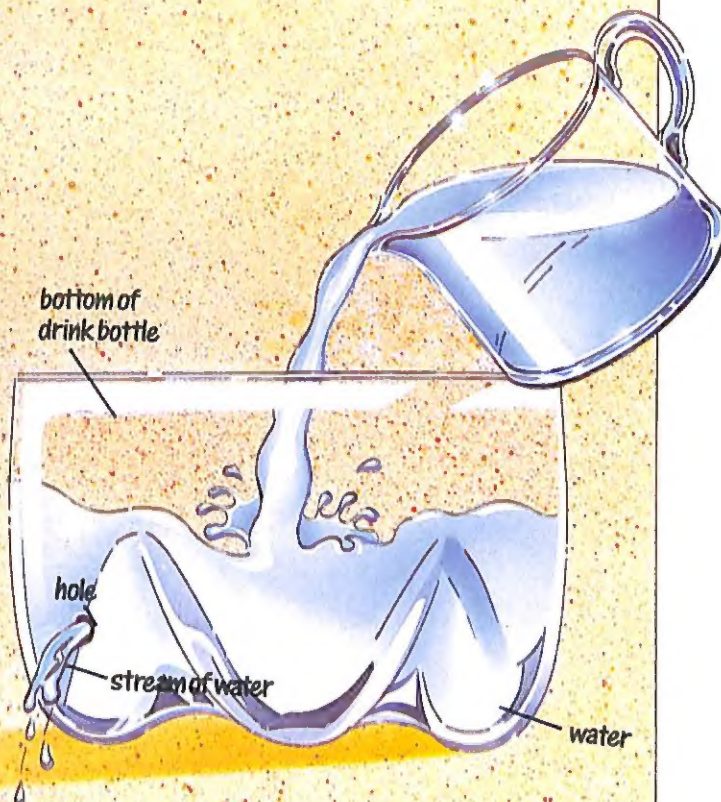
- A buffer memory is a short term storage device for computers. How can you see it working?

### A BUFFER MEMORY



A computer works much faster than a printer. See how the computer saves data before passing it to the printer.

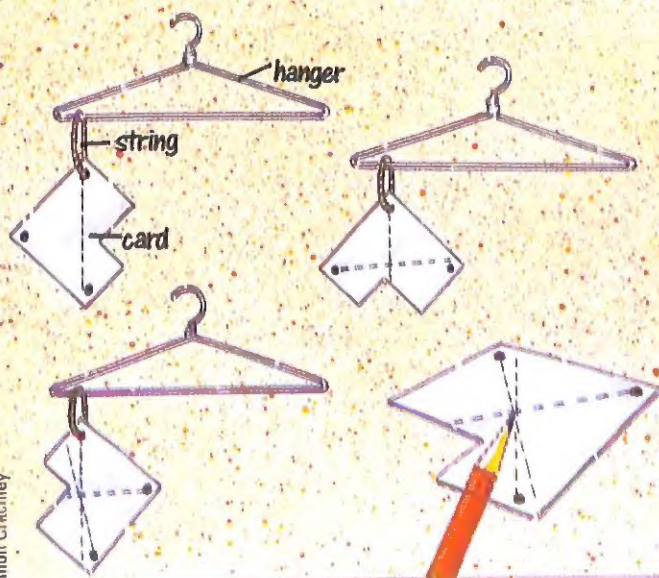
Take a plastic washing-up bottle or a soft-drinks bottle. Use a junior hacksaw to cut the bottle in half. Make a small hole in the side of the bottle near to the bottom with a skewer. Now fill the bottle with water. Watch the difference between the quantity of water you are pouring into the bottle and the amount coming out of the hole. This is how the 'buffer' memory of a computer works – storing data temporarily before passing it on.



### CENTRE OF GRAVITY



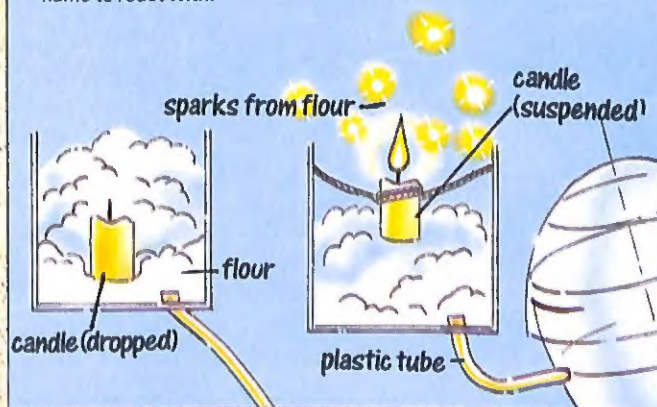
You will need a sheet of card, a piece of string, a coat hanger and a pencil. Cut the card into any shape, as irregular as you wish, then poke three holes in it as far away from each other as possible. Put the string through one hole, form it into a loop, and hang it from the coat hanger. Without disturbing the card draw a straight, vertical line on it from the hole to the opposite edge. Repeat with the other two holes. The lines will cross at a single point. This is the centre of gravity. To check this, balance the card on the pencil point.



### MOLECULES AND ATOMS



Pierce the bottom of a small tin and insert a plastic tube as shown. Suspend a small section of candle across the top and half fill the tin with flour. Light the candle and blow through the plastic tube. A large flame will rise because the molecules of flour are spread out and there is a larger surface area for the flame to react with.



### PROJECT INFORMATION



Each **QUEST** project has its own difficulty rating: 1 very simple, 2 simple, 3 intermediate, 4 advanced, 5 complicated.

**WARNING!**

Every care has been taken to ensure projects are as safe as possible. However, parents should supervise all projects. The publisher can accept no liability for injury.



# DATAQUEST

## FARMING: WORLDWIDE AGRICULTURAL PRODUCE

### Top 5 Milk Producers

	(tonnes per year)
Russia	78,900,000
USA	61,553,000
France	29,012,000
Germany	17,700,000
UK	16,720,000

### Top 5 Wine Producers

	(hectolitres per year)
France	69,000,000
Italy	60,327,000
Spain	30,320,000
Russia	28,000,000
Argentina	23,302,000

### Top 5 Fishing Countries

	(tonnes per year)
Japan	12,790,000
Russia	12,400,000
China	10,460,000
USA	5,000,000
Chile	4,900,000

### Top 5 Coffee Producers

	(tonnes per year)
Brazil	3,064,000
Columbia	660,000
Mexico	421,000
Indonesia	358,000
Ivory Coast	187,000

## HEALTH & MEDICINE: AVERAGE PERCENTAGE OF ADULT HEIGHT

Age in years	Boys %	Girls %	Age in years	Boys %	Girls %
5	61.8	66.2	11	81.1	88.4
6	65.2	70.3	12	84.7	92.9
7	69.0	74.0	13	87.3	96.5
8	72.0	77.5	14	91.5	98.3
9	75.0	80.7	15	96.1	99.1
10	78.0	84.4	16	98.3	99.6

So a boy measuring 137 cm on his ninth birthday could expect to be:  
 $137 \times 100/75 = 183$  cm fully grown.

## COMPUTERS: COMPUTER SPEED

### Unit of time

Millisecond

Microsecond

Nanosecond

Picosecond

### Part of a second

One-thousandth

One-millionth

One-billionth

One-trillionth

### Interpretation

A 152 km/h baseball would travel 50 mm

A 160,000 km/h spaceship would travel 50 mm

There are as many nanoseconds in a second as there are seconds in 30 yrs

A picosecond is to a second what a second is to 31,710 yrs

## COMPUTERS: COMPUTER DEVELOPMENT

Time to execute an instruction in the central processor

1950

300 microseconds

1960

5 microseconds

1970

80 nanoseconds

1975

25 nanoseconds

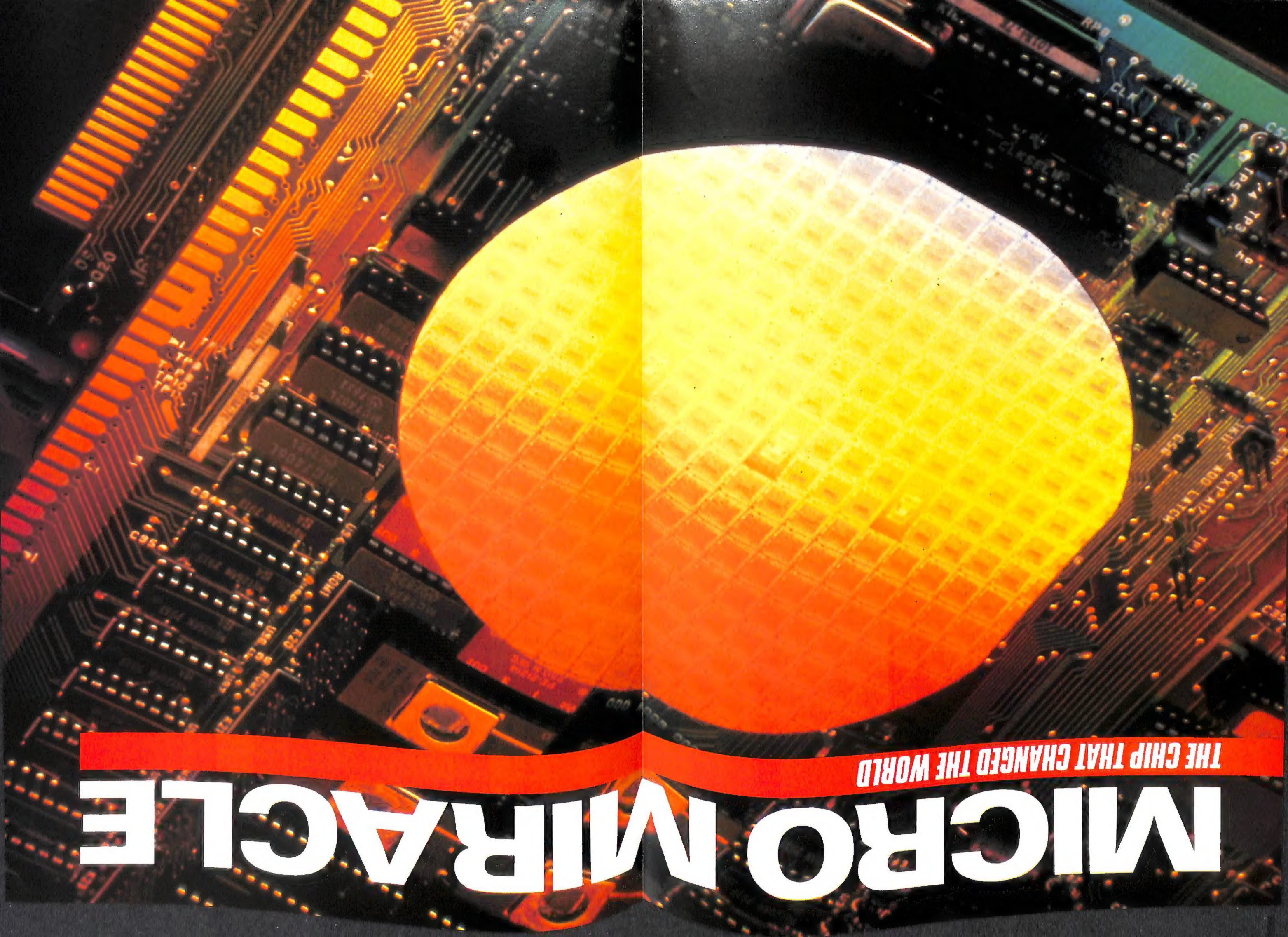
1980s

under 5 nanoseconds



# MICRO MIRACLE

THE CHIP THAT CHANGED THE WORLD



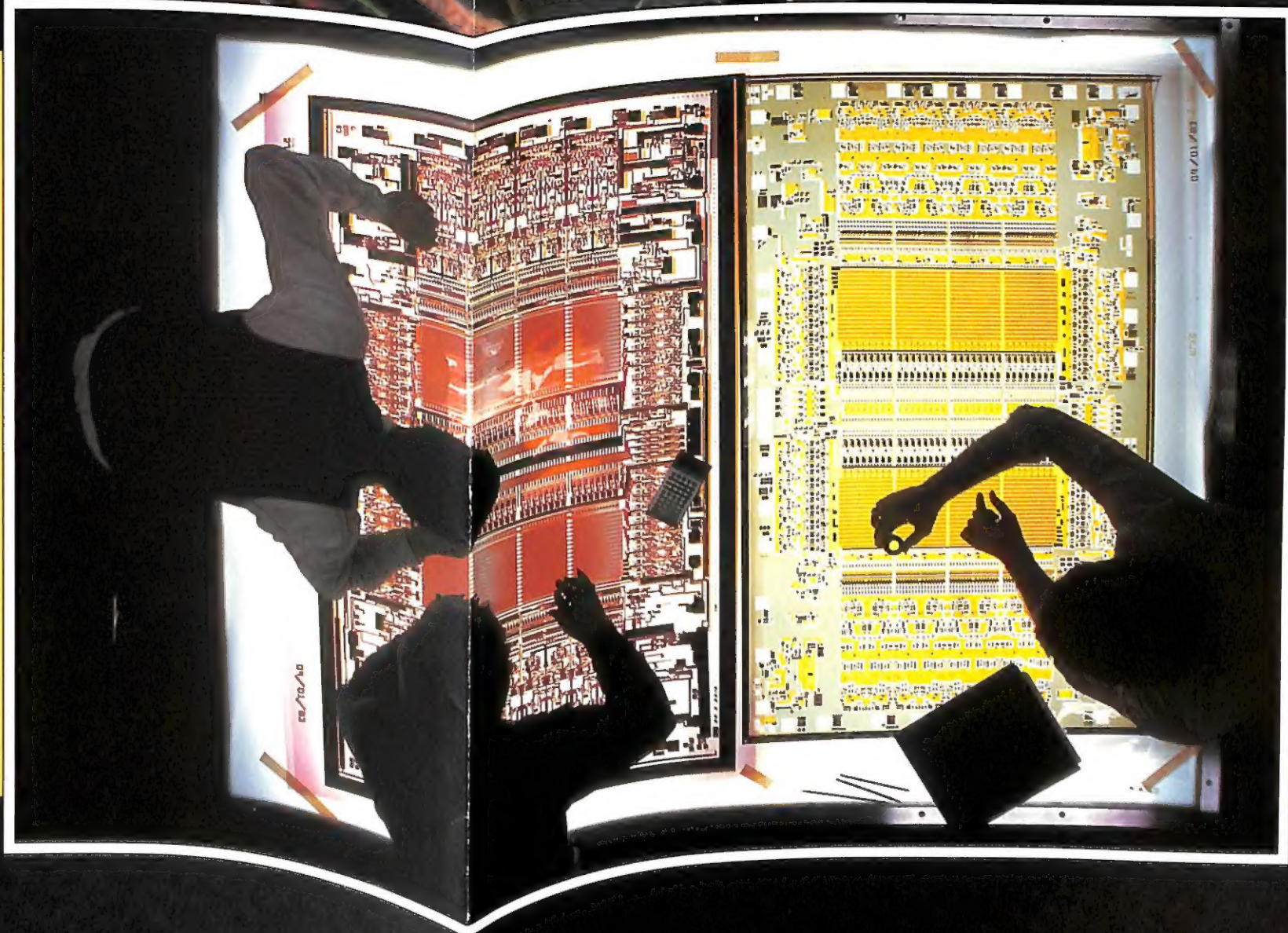


## CIRCUITS ON A SILICON CRYSTAL

More than any other recent invention, the silicon chip is shaping our lives and our futures. First developed during the 1960s' Space programme, the chip was a way of miniaturizing the electrical circuits needed to control a Space craft.

Electrical circuits used to be built up from separate components soldered to metal connecting strips on a circuit board. Then it was discovered that individual components could be created in minute areas of a single silicon chip and connected by tiny aluminium strips etched on the surface.

These 'integrated circuits' were extremely reliable. They were also very fast, so millions of simple computing operations could be performed every second. And single circuits became so small, that millions of them could be incorporated in a single device. This meant that huge slow computers could be replaced with small, fast devices and made it perfectly practicable to introduce computer control into everyday devices like cars, washing machines, televisions and telephones.



*The original design of an integrated circuit has to be drawn up several hundred times bigger than the actual chip. Once the design has been checked (pictured here), it is used to make a series of masks. These are photographically reduced and used as patterns during the manufacture of the chip.*

ZEFA

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